"Sarsens"

I SUPPOSE it is in the order of things that utility should be a prime consideration, but still one cannot but regret the wholesale destruction which is overtaking the picturesque stones which have given its name to the "Valley of Grey Wethers," near Marlborough.

This destruction has been going on for some years, as is witnessed by the cottages in the neighbourhood built of "sarsen," but has of late been vastly increased by the demand for this strong stone for the bridges on the railway now making between Swindon and Marlborough. Nearly all the large blocks have indeed already disappeared.

So far no attack has been made on the fine cromlech of the "Devil's Den," which lies at the foot of the valley. It has had a narrow escape before, for a weather-beaten shepherd told me some years back that he "minded" how when he was a boy the farmer there got all the horses and oxen and tackle he could in the parish and laid on to the capstone, and "they drawed 'un and drawed 'un, but *it warn't to be moved*."

The geological interest in these rugged stones is considerable. They are found, more or less, all over the chalk range, but always as scattered or isolated blocks. The temple at Avebury was constructed of monoliths of this stone, so is most part of Stonehenge. The cromlechs of "Kit's Cotty" and "Wayland Smith's Cave" are formed of it, and its curious mode of weathering is well shown by the "blowing stone" under Uffington Camp. There is hardly a village amongst the chalk hills in which a mass of this rugged stone may not be seen, but nowhere is it found in anything like the abundance which has characterised the "Valley of Grey Wethers."

It is, I believe, the generally-accepted view that these "sarsens" are the indurated remains of a tertiary stratum of sand with which the chalk was once overlaid. Perhaps some of your readers can inform me where these stones can be seen in their native sand. The circumstance of the fracture of some of the "grey wethers" near Marlborough disclosing imbedded in them what look to me like chalk flints possibly points to an earlier origin for them.

A. G. RENSHAW

May 19

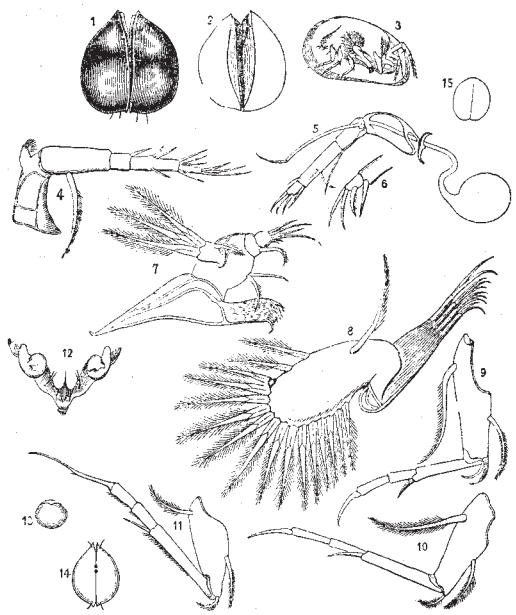
AN ENTOMOSTRACON LIVING IN TREE-TOPS

IT is not to be wondered at that the moist and shady hiding-places between the leaves of the Bromeliads, filled as they are by food of various descriptions, should be occupied by all sorts of animals, and that some of these should have chosen them as their favourite abodes and should have exclusively deposited their eggs in them. And indeed, according to Fritz Müller's friend, Friedenreich, almost all the coleoptera peculiar to the Bromeliads have been for the last thirty years found by him exclusively in such places, and the same is probably true of the larvæ of very many species of insects, and for the tadpoles of the tree-frogs, which undergo their metamorphoses therein.

But for all this it is, as Fritz Müller, writing from Itajahy, November, 1879, says, a very astonishing thing that there should be found living among the aquatic animals in the tops of the woods a little crustacean whose relations one is accustomed to find among the sea-weeds. It is about one millimetre long, and is of the family of the Cytheridæ.

Of the two cosmopolitan genera, each rich in species, Cypris and Cythere, into which the untiring investigator of the salt and fresh waters of Denmark, Otto Friedrich Müller, divided the bivalved crustacea, those of the first (Cypris) live almost entirely in fresh, and those of the second (Cythere) almost entirely in salt, water. Only a very few isolated exceptions to this rule have as yet come to light, and in the Brazils Fritz Müller only knows Cythere as having marine species, while those of Cypris are from fresh water; and never would he have expected to meet with, on the trees of his wood at Itajahy, an old Baltic acquaintance which he erewhile had collected when wading bare-footed with Max Schultze in Greiswalder Bay. At the first glance he did not recognise the Cythere of the Bromeliads as a relation of its recent marine cousins, because it differed a good deal in the shape of its bivalved shell from all known species of Cythere, and even from all known Entomostraca. These generally possess laterally-compressed valves, which are broader than they are long, and are commonly bean-shaped. In the Bromeliad-lodger the length of the valves is a good deal more than the breadth, and, in addition, the ventral surface is flattened, and has a longitudinal furrow, reminding one of a coffee-bean. In consequence of this, when this new form is out of the water, instead of falling on its side as the others would do, it falls upon its back, or upon its ventral surface. This is probably an adaptation to its place of abode. In the sea the species of Cythere climb up on the narrow filaments of the algæ; and in the Bromeliads they must move about on the flat surfaces of adjacent leaves.

While no recent entomostracon was known to Fritz Müller which this new form resembles, he was at once reminded of a species (*Elpe pinguis*) which occurs as one of the oldest fossil Cytheridæ, and which Barrande described from the Silurian strata of Bohemia. This the Bromeliad form very closely resembles, but it is just five times as small. Fritz Müller describes this new form as *Elpidium bromeliarum*, for though it possesses no very marked peculiarities in its feet, still it does not fit into even any of the genera into which the old genus Cythere has been of late subdivided.



Elpidium Bromeliarum, Fr. Müller. 1, dorsal aspect; 2, ventral aspect; 3, side view, right valve removed; 4, anterior antenna; 5, 6, posterior antenna of male and of female; 7, mandible; 8, maxilla; 9, 10, 11, feet, of 1st, 2nd, and 3rd pairs; 12, last body segments; 13 and 14, egg and young, from the parent valves; 15, *Elpe pinguis*, Barr. Magnified 1 to 3 = 10 : 1; 4 to 12 = 71 : 1; and 13 and 14 = 36 : 1.

Everywhere that Fritz Müller has looked for this new form, from the sea-side to some hundred kilometres into the interior, he has found it common in the tree-frequenting Bromeliads of the primæval woods. As it cannot, like some other of the animals inhabiting such places, wander from tree to tree, or even from one plant of Bromelia to another, its distribution must be affected by beetles (Agabus, Laccophilus, Hister, &c.), or some other of the Bromelia investing forms. The young Elpidia, when they leave their mother, are only 0·2 mill. long, and doubtless they cling to some of the flying insects, and so are transported. As, however, the colonisation of the Bromeliads is thus seemingly entirely left to chance, it

is the more astonishing that these little crustacea are found in almost every Bromeliad.

It cannot but sometimes happen that a few specimens must be washed away into other waters, as on the contrary, one may sometimes meet with a stray entrapped Cyclops that has slipped into the Bromeliads. Yet Fritz Müller has hitherto searched in vain for Elpidium in running waters, which produce, among other species, Cypris, Cyclops, Canthocamptus, Chydorus, Alona, Camptocercus, Pasithea, Moina, Ceriodaphnia, Simocephalus, &c. It seems not to flourish outside the Bromeliads.

[Translated from *Kosmos*, February, 1880. *Elpidium* comes somewhat near to *Elpidia*, Theel.—E. P. W.]

ON THE PHYSICAL ASPECTS OF THE VORTEX-ATOM THEORY

IN all attempts to arrive at a satisfactory conception of the ultimate constitution of matter, the grand difficulty has hitherto been to reconcile the proved indestructibility of the atom with its capacity for executing vibrations, as demonstrated by the spectroscope. The ancients, by assuming the atom to be *infinitely hard*, attempted in this way to get over the difficulty of indestructibility (or indivisibility), but thereby debarred all means of conceiving the "*elasticity*" of atoms, or their known powers of taking up vibrations of different periods.

When we consider the immense difficulty that there must have been in conceiving how an atom could be elastic (*i.e.*, how its parts could be capable of free motion) and yet its parts be incapable of separation from each other, we may well excuse the attempt to explain indestructibility by the assumption of the quality of *infinite hardness*, unsatisfactory though it might be.

It is evident that if we are to renounce all idea of occult qualities of "elasticity," hardness, indivisibility, &c., and purpose to explain the facts without recourse to postulates, we must assume the material substance of which our atoms are to be formed, to be itself entirely without any positive qualities, *i.e.*, to be without elasticity, hardness, rigidity, &c., and therefore to be freely penetrable in all parts, or perfectly passive and inert. This is the perfect liquid of the vortex-atom theory. There may be some who would say that it is difficult to conceive of such a liquid. On the contrary, we venture to be able to prove that such a liquid *always is conceived of* whenever a liquid is thought of. Thus, does any one in conceiving of a liquid (water, for instance), regard the liquid as consisting of solid (*i.e.*, more or less rigid) portions of matter sliding over each other [as we might conceive solid masses sliding past or through each other on a magnified scale]; and yet this is truly what the liquid (composed of molecules) is in the actual fact. In short it is not a "*liquid*" at all. Yet we conceive of it as *liquid*, *i.e.*, freely penetrable in all parts. We therefore contend that a perfect liquid (or true liquid) is what is *always* conceived of, and therefore that there can be no difficulty in regard to the conception of the true liquid that forms the basis of the vortex-atom theory.

In the next place, it is an obvious condition to any consistent conception of matter that matter must possess *extension*,[1] or occupy space, *i.e.*, so that two portions of our liquid cannot occupy the same space at the same time. If, therefore, the liquid fills all space, it must be incompressible. This is, therefore, not an arbitrary postulate.

The next question naturally suggesting itself would be, how are portions of such a liquid to attain the properties that we recognise in atoms? We venture to think it will be conceded as evident that the only *conceivable* way (if it be admitted that the result is attainable at all) is through *motion* [for this is the only conceivable way in which the liquid can be affected]. The further inquiry would therefore be, what would be the *character* of this motion? Now, in order to fulfil the condition that the atom itself can be brought to rest without losing its properties as an atom, it is evident that the motion of the material forming it must take place in such a way that the atom can remain in one spot, or be to our senses at rest, *i.e.*, the material of the atom, although in motion, must not deviate from one spot. We ask if there is any other *conceivable* form of motion than *rotary* motion that would fulfil this condition? Hence the necessity for looking to *rotary* motion as the basis of the properties of the atom. In the next place a portion of material in rotation must rotate about an *axis*. If the ends of this axis were exposed, we should have two points *at rest*, which would forfeit the condition of *motion* being the essential basis of the external qualities of our atom. The question is, therefore, how is a portion of material to be in rotation about an axis, and yet not expose the ends of the axis? The only *conceivable* answer (as we think will be admitted) is that the rotating portion of material must have the form of a closed ring, or complete circuit, so that the axis has no ends. We therefore think it may be said beforehand that conceding that the problem of the atom can be solved at all (or if it be conceded that a fact can exist solely in virtue of the explanation that underlies it) then the problem could only *conceivably* be solved under the fundamental conditions above developed, *i.e.*, under the condition of a portion of material (having no positive properties in itself) *rotating* in the form of a *closed circuit*.

This (as is well known) is what has been found to satisfy the conditions for the atom by the application of mathematical analysis (without, apparently, that object having been in view at all), and in a manner the most remarkable in its completeness. It appears possible, in view of the above considerations, that a profound and competent thinker who had devoted himself to the subject might have arrived, even before the mathematical analysis had been applied, at the *sole conceivable* physical conditions that in principle could satisfy the problem of the atom (admitting the *existence* of the solution); but the mathematical analysis can of course alone make the fact of the solution apparent to us. It is related in the article on "The Atomic Theory of Lucretius" (*North British Review*, March, 1868) that Hobbes had arrived at the fundamental idea that the *rotation* of a portion of material must be the basis to the solution of the problem of the "elasticity" of the atom, without having applied any mathematics.

The difficulty of the mathematical side of the vortex-atom theory is curiously contrasted with the simplicity of the physical side of the theory. If we suppose a cylindrical bar of india-rubber to be rotated about its longitudinal axis, and the bar (still rotating) to be bent round into a ring shape and the ends joined (the rotation of the material of the ring being always continued), then this may serve to illustrate in a simple way the motion of the material forming the vortex-atom. It is here apparent that the material of the india-rubber ring (in our illustrative case) may be in rapid motion while the ring itself preserves a fixed position in space. It would seem to be a pity if a spurious mystery should be allowed to envelope this subject, which is unworthy of it, in view of the simplicity of its physical basis. No one doubts the difficulties that had to be surmounted on the mathematical side of the theory, but there is all the more reason on that account that the extreme simplicity of the physical side of the theory should be duly appreciated, and unnecessary obstacles not be thrown in the way of its adoption. The tendency to invest physical subjects with a halo of the occult [possibly partly attributable to the unfortunate introduction into physical science of the spiritualistic conception of "*force*"—in the sense of an action across space without the intervention of matter] has probably done more to hinder progress than any real difficulties.

[1] The quality of extension may even be regarded as included in the definition of matter.